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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/258,961	03/01/1999	TONGBI JIANG	98-0645.1	4605

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EXAMINER
PAREKH, NITIN

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 05/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/258,961	JIANG ET AL.	
	Examiner	Art Unit	
	Nitin Parekh	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 March 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *24-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *24-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03-01-99* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Request for Continued Examination

1. A request for continued examination (RCE) under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 03/19/03 has been entered. An action on the RCE follows.

2. The amendment filed on 03/19/2003 has been entered.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 24, 25, 34 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art (APA) in view of Lee et al. (US Pat. 5796586).

Regarding claim 24, the admitted prior art (Fig.1A and B; pages 2-4) discloses a semiconductor package comprising :

- a substrate (12 in Fig. 1A) comprising a first and second surfaces (24 and 22 respectively in Fig. 1A),a plurality of conductors/pads formed on the first surface and a bonding opening (26 in Fig. 1A) from the first surface to the second surface
- a semiconductor die (16 in Fig. 1A) having a first outline and a face being aligned with the bonding opening and attached/bonded to the second surface on a die attach area using an adhesive (34 in Fig. 1A)
- first mask (20A in Fig. 1A) on the first surface of the substrate
- a second mask (20B in Fig. 1A) substantially covering a second surface of the substrate
- the adhesive layer between the die/face and the substrate in the die attach area to bond the die to the second mask and the substrate,
- a plurality of wires (28 in Fig. 1A) placed through the bonding opening and wire bonded to the die and being in electrical communication with the respective conductors
- an encapsulating material/epoxy resin (38 in Fig. 1A) on the die and the second mask, and

- a glob top/polymer (40 in Fig. 1A) in the bonding opening encapsulating the wire.

The admitted prior art (APA) fails to specify:

a) the die being directly bonded to the second surface and having an opening in the second mask including a second outline corresponding to the first outline defining the die attach area, and

b) the adhesive layer being between the face and the die attach area.

a) Lee et al. teach using a second mask having an opening through the mask with a second outline (see hatched mask area 218' with a second outline- Fig. 7; Col. 7, line 55) substantially matching/corresponding to a first outline defining an open die attach area (see first outline area 204- Fig. 7) on the second surface so that the die is directly bonded to the second surface to provide an area with improved adhesion with the substrate (see abstract: lines 8-11; Fig. 7 and Fig. 1-6; Col. 1-8).

b) Lee et al. further teach the die bonding structure where the attach area of the die having different adhesives which are not covered with solder mask so that the die attaches directly to the substrate surface including an adhesive (not numerically referenced in Fig. 7; see Col. 6, line 30) for the wire bonded die and an adhesive such as conductive/filler-based epoxy (Col. 6, line 45-50) for the flipchip/bumped die.

It would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate the directly bonding the die to the second surface and having an opening in the second mask including a second outline corresponding to the first outline defining the die attach area and the adhesive layer being between the face and the die attach area as taught by Lee et al. so that the bonding to the substrate and the reliability of the package can be improved in the APA.

Regarding claim 25, the APA teaches using the encapsulating resin comprising the epoxy material (38 in Fig. 1A; specification page 3, line 9).

Regarding claim 34, the admitted prior art (Fig.1A and B; pages 2-4) discloses a semiconductor package comprising :

- a substrate (12 in Fig. 1A) comprising a first and second surfaces (24 and 22 respectively in Fig. 1A),a plurality of conductors/pads formed on the first surface and a bonding opening (26 in Fig. 1A) from the first surface to the second surface
- a semiconductor die (16 in Fig. 1A) having a first outline and a face being aligned with the bonding opening and attached/bonded face down to the second surface on a die attach area using an adhesive (34 in Fig. 1A)
- first mask (20A in Fig. 1A) on the first surface of the substrate
- a second mask (20B in Fig. 1A) substantially covering a second surface of the substrate

- the adhesive layer between the die/face and the substrate in the die attach area to bond the die to the second mask and the substrate,
- a plurality of wires (28 in Fig. 1A) placed through the bonding opening and wire bonded to the die and being in electrical communication with the respective conductors
- an encapsulating material/epoxy resin (38 in Fig. 1A) on the die and the second mask, and
- a glob top/polymer (40 in Fig. 1A) in the bonding opening encapsulating the wire.

The admitted prior art (APA) fails to specify:

a) the die being bonded to the second surface and having an opening in the second mask including a second outline corresponding to but slightly larger than the first outline defining the die attach area, and

b) the adhesive layer being between the face and the die attach area.

a) Lee et al. teach using a second mask having an opening through the mask with a second outline (see hatched mask area 218' with a second outline- Fig. 7; Col. 7, line 55) substantially matching/corresponding to a first outline defining an open die attach area (see first outline area 204- Fig. 7) on the second surface so that the die is directly bonded to the second surface to provide an area with improved adhesion with the substrate (see abstract: lines 8-11; Fig. 7 and Fig. 1-6; Col. 1-8).

Lee et al. further teach using the solder mask patterns where the second outline larger than the die attach region/first outline (Fig. 1A and 1B; Col. 1 and 2).

b) Lee et al. further teach the die bonding structure where the attach area of the die having different adhesives which are not covered with solder mask so that the die attaches directly to the substrate surface including an adhesive (not numerically referenced in Fig. 7; see Col. 6, line 30) for the wire bonded die and an adhesive such as conductive/filler-based epoxy (Col. 6, line 45-50) for the flipchip/bumped die.

It would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate the directly bonding the die to the second surface and having an opening in the second mask including a second outline corresponding to but slightly larger than the first outline defining the die attach area and the adhesive layer being between the face and the die attach area as taught by Lee et al. so that the bonding to the substrate and the reliability of the package can be improved in the APA.

Regarding claim 35, the APA teaches using the glob top (40 in Fig. 1A) in the bonding opening encapsulating the wires (specification: page 3, line 10).

5. Claims 26-33 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art (APA) and Lee et al. (US Pat. 5796586) as applied to claims 24 and 34 above respectively, and in further in view of Hoffman et al. (US Pat. 5360942).

Regarding claim 26, APA and Lee et al. teach substantially the entire claimed structure as applied to the claim 24 above, except the adhesive layer comprising a filled adhesive configured to transfer heat from the face to the second surface.

Lee et al. further teach the die bonding structure having different adhesives including the conductive/filler-based epoxy (Col. 6, line 45-50).

Hoffman et al. teach using a die attach/adhesive material comprising a filled epoxy (40 in Fig. 3) configured to provide improved heat transfer and/or electrical conductivity (Col. 3, line 60- Col. 4, line 2).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate the adhesive layer comprising a filled adhesive configured to transfer heat from the face to the second surface as taught by Hoffman et al. so that the adhesion, thermal performance and reliability for the package can be improved in Lee et al. and APA's package.

Regarding claim 27, the APA and Lee et al. teach substantially the entire claimed structure as applied to the claim 24 above, except the adhesive layer comprising a filled adhesive configured to transfer heat from the face to the second surface.

Lee et al. further teach the die bonding structure where the attach area of the die having different adhesives which are not covered with solder mask so that the die attaches directly to the substrate surface including an adhesive (not numerically referenced in Fig. 7; see Col. 6, line 30) for the wire bonded die and an adhesive such as conductive/filler-based epoxy (Col. 6, line 45-50) for the flipchip/bumped die.

Hoffman et al. teach using a die attach/adhesive material comprising a filled epoxy (40 in Fig. 3) configured to provide improved heat transfer and/or electrical conductivity (Col. 3, line 60- Col. 4, line 2).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate the directly bonding the die to the second surface and having an opening in the second mask including a second outline corresponding to the first outline defining the die attach area and the adhesive layer being between the face as taught by Lee et al. and the adhesive layer comprising a filled adhesive configured to transfer heat from the face to the second surface as taught by Hoffman et al. so that the adhesion, thermal performance and reliability for the package can be improved in Lee et al. and APA's package.

Regarding claim 28, the APA (Fig.1A and B; pages 2-4) teaches using the glob top (40 in Fig. 1A) in the bonding opening encapsulating the wires (specification: page 3, line 10).

Regarding claim 29, the APA teaches using the solder masks comprising a photoimageable material (specification: page 3, line 31).

Regarding claim 30, the APA and Lee et al. teach substantially the entire claimed structure as applied to the claim 24 above, except the adhesive layer comprising a filled adhesive configured to transfer heat from the face to the second surface.

Lee et al. further teach the die bonding structure where the attach area of the die having different adhesives which are not covered with solder mask so that the die attaches directly to the substrate surface including an adhesive (not numerically referenced in Fig. 7; see Col. 6, line 30) for the wire bonded die and an adhesive such as conductive/filler-based epoxy (Col. 6, line 45-50) for the flipchip/bumped die.

Hoffman et al. teach using a die attach/adhesive material comprising a filled epoxy (40 in Fig. 3) configured to provide improved heat transfer and/or electrical conductivity (Col. 3, line 60- Col. 4, line 2).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate the directly bonding the die to the second surface and having an opening in the second mask including a second outline corresponding to

the first outline defining the die attach area and the adhesive layer being between the face as taught by Lee et al. and the adhesive layer comprising a filled adhesive configured to transfer heat from the face to the second surface as taught by Hoffman et al. so that the adhesion, thermal performance and reliability for the package can be improved in Lee et al. and APA's package.

Regarding claim 31, the APA teaches using the encapsulating resin comprising the epoxy material (38 in Fig. 1A; specification page 3, line 9).

Regarding claim 32, the APA (Fig.1A and B; pages 2-4) teaches using the polymer/encapsulant/glob top (40 in Fig. 1A) in the bonding opening encapsulating the wires (specification: page 3, line 10).

Regarding claim 33, the APA and Lee et al. teach substantially the entire claimed structure as applied to the claim 30 above, except the adhesive layer comprising a filled epoxy.

Lee et al. further teach the die bonding structure where the attach area of the die has different adhesives including the conductive/filler-based epoxy (Col. 6, line 45-50).

Hoffman et al. teach using a die attach/adhesive material comprising a filled epoxy (40 in Fig. 3) configured to provide improved heat transfer and/or electrical conductivity (Col. 3, line 60- Col. 4, line 2).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate the adhesive layer comprising the filled epoxy as taught by Hoffman et al. so that the adhesion, thermal performance and reliability for the package can be improved in Lee et al. and APA's package.

Regarding claim 36, the APA and Lee et al. teach substantially the entire claimed structure as applied to the claim 34 above, except the adhesive layer comprising a filled epoxy.

Lee et al. further teach the die bonding structure where the attach area of the die has different adhesives including the conductive/filler-based epoxy (Col. 6, line 45-50).

Hoffman et al. teach using a die attach/adhesive material comprising a filled epoxy (40 in Fig. 3) configured to provide improved heat transfer and/or electrical conductivity (Col. 3, line 60- Col. 4, line 2).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate the adhesive layer comprising the filled epoxy as taught by Hoffman et al. so that the adhesion, thermal performance and reliability for the package can be improved in Lee et al. and APA's package.

Response to Arguments

6. Applicant's arguments filed on 03-19-03 have been fully considered but they are not persuasive.

A. Applicant contends that there is no teaching of having improved adhesion in Lee et al. by using the direct attachment of the die to the substrate.

However, as explained above, Lee et al. teach the direct bonding of the die to the second surface of the substrate using the adhesive to provide an improved adhesion with the substrate where the bonding surface is not covered with the solder mask (see abstract: lines 8-11; Fig. 7).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nitin Parekh whose telephone number is 703-305-3410. The examiner can normally be reached on 09:00AM-05:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722, 703-308-7724 or 703-872-9318 (Right FAX) for regular communications; 703-872-9310 (Right FAX) for After Final communications and 703-872-9310 (Right FAX) for customer service.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-306-3431.

Nitin Parekh

NP

05-03-03

Tom Thomas

TOM THOMAS
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